

TABLE 2.—Free-air resultant winds (m. p. s.) during October, 1925

Altitude m. s. l. (meters)	Broken Arrow, Okla. (233 meters)				Drexel, Nebr. (396 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)			
	Mean		8-year mean		Mean		10-year mean		Mean		5-year mean		Mean		8-year mean		Mean		8-year mean		Mean		8-year mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface	N. 37° E	0.8	S. 2° E	2.1	N. 84° W	1.2	S. 25° W	1.4	N. 46° W	0.7	N. 47° E	2.2	N. 40° W	3.4	N. 69° W	1.7	N. 15° W	0.5	S. 74° E	0.7	S. 71° W	2.8	S. 49° W	2.3
250	N. 36° E	0.8	S. 5° E	2.3	N. 85° W	1.8	S. 29° W	2.1	N. 51° W	0.7	N. 47° E	2.3	N. 45° W	3.4	N. 80° W	1.8	N. 26° W	0.3	S. 51° E	1.1	S. 68° W	3.2	S. 47° W	2.5
500	S. 67° E	0.4	S. 9° E	3.3	S. 85° W	1.8	S. 29° W	2.1	N. 87° W	1.4	N. 52° E	3.1	N. 45° W	3.4	N. 80° W	1.8	N. 48° E	0.3	S. 27° E	2.5	S. 63° W	5.5	S. 53° W	4.7
750	S. 50° W	1.8	S. 12° W	4.1	N. 60° W	3.5	S. 42° W	3.5	S. 73° W	2.8	N. 58° E	2.8	N. 50° W	4.2	N. 88° W	2.7	S. 27° W	1.3	S. 14° E	2.8	S. 63° W	6.5	S. 62° W	5.8
1,000	S. 61° W	2.3	S. 21° W	4.1	N. 55° W	4.4	S. 51° W	3.9	S. 81° W	4.1	N. 54° E	1.9	N. 53° W	5.4	N. 86° W	3.2	S. 33° W	2.1	S. 4° E	2.8	S. 70° W	6.6	S. 65° W	6.3
1,250	S. 65° W	3.1	S. 35° W	4.2	N. 54° W	4.7	S. 61° W	4.5	N. 87° W	6.3	N. 33° E	1.1	N. 43° W	6.0	N. 84° W	3.9	S. 37° W	3.2	S. 5° W	2.9	S. 83° W	9.1	S. 74° W	7.2
1,500	S. 63° W	5.2	S. 42° W	4.5	N. 56° W	5.9	S. 67° W	5.2	N. 87° W	7.6	N. 33° W	0.7	N. 46° W	6.5	N. 85° W	4.6	S. 48° W	4.0	S. 20° W	2.8	S. 85° W	9.5	S. 78° W	8.0
2,000	S. 74° W	6.5	S. 52° W	4.5	N. 63° W	8.6	S. 75° W	7.0	N. 74° W	5.5	N. 39° W	1.2	N. 52° W	7.9	N. 82° W	6.2	S. 61° W	5.5	S. 45° W	2.8	S. 89° W	10.6	S. 81° W	9.1
2,500	N. 82° W	8.0	S. 65° W	5.2	N. 68° W	10.2	S. 80° W	8.2	N. 77° W	11.6	N. 75° W	3.9	N. 47° W	9.8	N. 79° W	7.7	S. 52° W	7.1	S. 53° W	3.2	S. 88° W	12.8	S. 85° W	10.1
3,000	N. 84° W	9.0	S. 70° W	6.4	N. 74° W	13.1	S. 84° W	9.7	N. 86° W	13.3	N. 86° W	5.0	N. 55° W	11.2	N. 81° W	9.0	S. 54° W	9.2	S. 56° W	3.8	N. 84° W	15.2	S. 86° W	11.0
3,500	N. 73° W	11.1	S. 78° W	7.5	N. 75° W	13.9	S. 89° W	10.5	N. 85° W	14.3	N. 83° W	6.8	N. 57° W	13.4	N. 82° W	10.9	S. 65° W	10.1	S. 51° W	4.2	N. 68° W	16.2	S. 85° W	13.0
4,000	N. 78° W	14.0	S. 68° W	8.6	N. 85° W	15.0	S. 86° W	11.6	-----	-----	-----	-----	N. 56° W	14.1	N. 86° W	11.4	S. 43° W	12.3	S. 46° W	4.0	-----	-----	-----	-----
4,500	-----	-----	-----	-----	N. 45° W	17.0	N. 84° W	12.4	-----	-----	-----	-----	N. 67° W	14.1	S. 82° W	13.2	S. 22° W	9.9	S. 54° W	2.6	-----	-----	-----	-----

TABLE 3.—Mean free-air temperatures, relative humidities, vapor pressures, and resultant winds during October, 1925, at Washington, D. C.

Altitude m. s. l. (meters)	Naval Air Station (7 meters)			Weather Bureau (34 meters)	
	Temperature (° C.)	Relative humidity (per cent)	Vapor pressure (mb)	Wind	
				Direction	Velocity (m. p. s.)
Surface	10.1	77	10.03	N. 65° W.	1.7
150	9.4	72	9.03	N. 41° W.	2.8
100	8.8	68	8.21	N. 50° W.	4.2
250	7.4	68	7.44	N. 65° W.	5.4
5,000	6.0	69	6.91	N. 65° W.	6.4
7,250	4.7	71	6.48	-----	-----
1,500	3.4	71	5.93	N. 64° W.	8.2
2,000	1.2	75	4.88	N. 83° W.	10.9
2,500	0.5	63	3.69	N. 82° W.	13.5
3,000	-0.8	51	2.78	N. 75° W.	17.5
3,500	-2.8	60	2.42	N. 79° W.	20.5

THE WEATHER ELEMENTS

By P. C. DAY, In Charge of Division

PRESSURE AND WINDS

Unlike the preceding month, October had rapid and important pressure variations, and the weather on the whole had a decided winter aspect from the Rocky Mountains eastward, with record-breaking low temperatures over wide areas, frequent rains in the central and eastern districts, some unusually heavy snows for the season, much cloudy weather and a large deficiency in sunshine.

Cyclonic areas during the first half of the month originated mostly in the Southwest, were mainly ill-defined, but frequently were attended by widely distributed precipitation.

During the latter half cyclonic activity shifted to more northern districts and most storms entered the United States from the Canadian Northwest, frequently well east of their usual course and at times followed each other in rapid succession.

No cyclones appear to have entered the United States via the North Pacific States, a condition rarely existing in October.

While precipitation was frequent in most districts from the Rocky Mountains eastward, it was particularly so in the middle Mississippi and Ohio Valley States and thence eastward, where locally the number of days with rain or snow was the greatest ever observed in October. To the north, precipitation was also frequent, but mostly light, while over the cotton-growing States it was both frequent and locally heavy.

Over the Southern States it was usually associated with the general low-pressure conditions existing in that region near the middle of the month and again about the middle of the last decade.

West of the Rocky Mountains cyclonic activity was at a low ebb due to anticyclonic conditions off the Pacific coast, and there was generally little precipitation over the northern districts, but over southern California and near-by portions of Arizona some unusually heavy rains occurred about the 3d to 6th, and important falls were reported from many parts of the plateau and Pacific coast sections from the 9th to 15th.

Anticyclones persisted to a considerable degree over the upper Missouri Valley and northern Rocky Mountain region, and several of unusual intensity for so early in the cool season moved southeastward into the central and eastern districts. The first, bringing important changes in temperature and interruption to the prevalent rainy conditions, was central over the middle Missouri Valley on the morning of the 9th and moved rapidly to the south Atlantic coast by the 11th, attended by decided falls in temperature, the first killing frosts of the season over extensive portions of the interior, and light frosts in some northern portions of the cotton-growing States.

Another extensive anticyclone entered the upper Missouri Valley on the morning of the 18th and it too moved southeastward, reaching the Gulf coast by the 20th. This likewise was attended by sharp falls in temperature, while frosts occurred somewhat farther south than in the preceding case.

The most important anticyclone, however, entered the northern Rocky Mountain region on the morning of the 27th and gradually overspread the entire country from the Rocky Mountains eastward during the closing days of the month. During its eastward progress the lowest temperatures ever observed in October occurred over large areas from the middle and northern plains eastward to the Ohio Valley and portions of the Northeastern States, and freezing temperatures extended to the middle portions of the Gulf States.

The average pressures were highest over the northern Great Plains and they were generally above normal from the far Northwest eastward to the upper Lakes and generally over the middle and southern plains. Over most districts from the Great Lakes, Ohio and lower Mississippi Valleys eastward the average pressures were mainly below normal, the deficiencies increasing toward the Canadian Maritime Provinces. Over the greater part of the plateau and Pacific Coast States the average pressures were below normal.

Compared with September the average pressures were far higher over the central valleys and Northwest, but considerably lower over eastern Canada and the Northeastern States.

High winds over extensive areas were confined mainly to the Great Lakes region and North Atlantic coast, though local storms of some severity were reported from limited areas in many districts from the Rocky Mountains eastward. The greatest number was reported on the 24th and 25th when considerable damage occurred over southern and eastern districts, a severe tornado occurring in the early morning of the 25th in southeastern Alabama, causing the loss of 18 lives and heavy damage to property; also, in the vicinity of Woburn, Mass., on the same date, beside one fatality, six persons were injured and many buildings wrecked. The details concerning these and other storms of the month appear at the end of this section.

The distribution of the average atmospheric pressure favored northerly winds over the central valleys and most southern districts from Texas eastward. Over the Great Lakes and Ohio Valley the winds were mainly from the west or southwest. Elsewhere they were chiefly variable.

TEMPERATURE

Probably the most pronounced change from normal conditions, in a month of many abnormalities, was the widespread deficiency in temperature, embracing nearly the entire country and continuous to an unusual extent throughout the month. No previous October in the past 50 years or more has had temperatures so low on the whole over nearly all central and northern districts from the Rocky Mountains eastward, and the minimum readings for the month, mostly near the end, were likewise the lowest ever observed over much of the same area. In some cases, notably in South Dakota and adjacent areas, the lowest temperatures were from 5° to 15° lower than ever before observed in October. Chart III shows the area and amount of the deficiency in temperature as compared with normal October values. The only previous October in the past 50 years having similar temperature conditions was in 1917, which was slightly cooler than the present October in a few southern localities, though the area of large negative departure was not so extensive as in the present month. Over the Florida peninsula and small areas of the East Gulf and South Atlantic States the month was slightly warmer than normal, and similar conditions prevailed along the Pacific coast from central California to northern Washington.

The first week was mostly warmer than normal over the Southern States, a continuation of the condition existing during September, but elsewhere, particularly over the northern Great Plains and in the Northeast, this week was distinctly cold. For the 7-day period ending October 13 temperatures continued low over all northern districts and the cold advanced southward into the region where high temperatures had persisted during the previous week, so that only small areas of the Gulf and South Atlantic States had average temperatures appreciably above the normal. A narrow area along the North Pacific coast also had averages slightly above normal, but elsewhere the week was nearly continuously cold.

The third week was on the whole again colder than normal over all parts of the country, save from the Gulf coast northeastward to the Middle Atlantic States. Over the central valley, Great Plains, and Rocky Moun-

tain sections the weekly averages ranged from 6° to 12° below normal.

The final decade experienced rapid weather changes east of the Rocky Mountains and toward the end the severest and most widespread cold wave ever known in October overspread the northern and central portions of this area.

The highest temperatures occurred usually during the first decade, the 7th and 8th being particularly warm in the Gulf States where locally the readings were the highest ever observed in October. Over the Atlantic coast States, however, the warmest days were the 16th and 17th, when locally in North Carolina and Virginia temperatures were the highest ever experienced so late in the month.

From the Rocky Mountains eastward the lowest temperatures were observed almost universally during the severe cold wave of the 28th-31st. Elsewhere they occurred mainly on the 14th-15th and 24th-25th.

The lowest temperature observed was -28° at a point in Montana, and readings of -15° to -20° were reported from Iowa, Nebraska, and the Dakotas, and of zero or lower as far south as Missouri. Temperatures below freezing were reported from some point in all the States except Florida, where the lowest observed was 37°.

The protection afforded the Northern States west of the Rocky Mountains from the cold waves to the eastward, was well illustrated during the month. Immediately west of the mountains in Idaho 8° was the lowest. Similarly in eastern Wyoming -20° occurred, while west of the divide in Utah and Idaho it was nearly 30° warmer.

PRECIPITATION

Precipitation also showed abnormal variations; most important being the early occurrence of phenomenally heavy snowfall for October in many parts of the eastern two-thirds of the country, and the total number of days with rain or snow over the same area, which in many instances broke October records.

The total precipitation was in a few instances in excess of any previously reported for October, notably in portions of West Virginia and southern California. On the other hand, in the far Northwest and over central and northern California the month was notably dry, a few localities in the former region having as little precipitation as in any previous October of record. There was a slight deficiency from the middle plains northeastward to the upper Lakes and over Florida and along the South Atlantic coast.

The plentiful precipitation over most districts was in sharp contrast to that of many of the months preceding and very generally relieved the severe drought in the southeast, except in a few localities of the southern Appalachians, where precipitation was barely sufficient to keep stream flow at the level existing at the beginning of the month.

Precipitation was far in excess of the normal over the lower Mississippi Valley and middle Gulf States, from Iowa and Missouri eastward to the Atlantic coast and over New England, and there was a marked excess in southern California, with moderate excesses over much of the western mountain regions. The precipitation was well distributed through all parts of the month except in the far West where it was limited to a few dates only, and, while far in excess of present requirements in many localities, and interfering greatly with outdoor occupations, still it was needed to replenish the water supplies which had become greatly depleted during the long drought.

SNOWFALL

Over most of the northern and central districts from the Rocky Mountains eastward snow was observed earlier than ever before known and the depths were the greatest of record for October.

Monthly amounts ranging up to 2 feet or more were reported from the eastern slopes and foothills of the Rocky Mountains from Colorado to Montana, and from 5 to 10 inches or more in portions of the Great Lakes, New York and New England. Farther south amounts were usually less, but in practically all cases the depths were far greater than ever before measured in October, and in many instances it was the first occurrence of record in that month.

In the vicinity of Washington, D. C., it is recorded that snow fell on October 24, 1853, to varying depths, Winchester, Va., reporting a "remarkable snowstorm, 10 to 12 inches," and "deep snow" was reported from other points near-by.

West of the Rocky Mountains snowfall occurred only at the higher elevations and the depths were not unusual for October.

RELATIVE HUMIDITY

Over a narrow area along the entire Atlantic coast and including the Florida peninsula the average relative humidity was slightly less than normal, and similar conditions existed along the Pacific coast from central California to Washington. Otherwise the relative humidity was above normal in all parts of the country, the excesses being conspicuously large in the regions with a corresponding deficiency in temperature.

SUNSHINE AND CLOUDINESS

October is usually a month of abundant sunshine, often attended by a hazy or slightly smoky condition of the atmosphere and generally associated with moderate warmth, frequently constituting a near return to summer. No such conditions were experienced during this month. The amount of sunshine in many sections was only a small fraction of the possible, and cloudy weather predominated to an unusual degree over the eastern two-thirds of the country. Over the districts to westward of the Rocky Mountains, however, conditions were largely reversed and locally the amounts of sunshine were far in excess of those usually received.

SEVERE LOCAL HAIL AND WIND STORMS

The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path ¹	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Detroit, Mich.	2					Thunderstorm and downpour.	Several districts flooded; telephone and electric power service interrupted; traffic delayed; some damage by lightning.	Free Press (Detroit, Mich.)
Keokuk, Iowa	2-3					Thunderstorm and hail.	600 panes of glass broken in greenhouse; other minor damage.	Official, U. S. Weather Bureau.
Gevin (near), Iowa	3	2 a. m.	880		\$3,000	Small tornado.	Outbuildings, orchards, and timber damaged; much corn blown down. Path 1½ miles long.	Do.
Greenfield Ill.	3					Electrical.	36 hogs killed by lightning; no other loss reported.	Do.
Atlanta, Mo.	4	1 p. m.	1,780-2,200		5,000	Thunderstorm and hail.	Buildings unroofed, chimneys blown down; crops damaged to the amount of \$1,500 by hail. Path 20 miles long.	Do.
Memphis, Tenn.	4				1,500	Thunderstorm.	Houses, electric light and power lines damaged.	Do.
Fresno (near), Calif.	5	4-5 p. m.	3,520		50,000	Heavy hail and rain.	Aside from hail damage, there was considerable rain damage to grapes on vines, also to basement stocks of merchandise by flooding. Path 20 miles long.	Do.
West Chesapeake Bay section, Md.	10					Wind.	Corn in shocks damaged, trees uprooted and some fruit blown off; communication interrupted locally.	Do.
New Jersey (northern half of)	10			1		Severe wind.	Insecure structures wrecked; plate glass windows broken; branches torn from trees and shrubbery. Live wire caused 1 death at Orange.	Official, U. S. Weather Bureau.
New York, N. Y., and vicinity.	10			5		Wind.	Many small boats and several barges wrecked on the Hudson; wire service impaired; 15 boats valued at \$500,000 swept on rocks off Kingsland Point.	Boston Transcript (Mass.).
New England.	10-11			1		Wind, rain, snow, and electrical.	Heavy property damage; apple crop suffered severely; much wire damage; along coast ships held up and small craft in trouble. Many serious accidents occurred.	Boston Transcript (Mass.). Hartford Courant (Conn.);
Comite (near), La.	14	8:37 a. m.		5	1,200	Small tornado.	Small home destroyed; other houses moved from foundations; trees damaged; storm covered about an acre.	Official, U. S. Weather Bureau.
Southern Oklahoma.	14	3:30-7:30 p. m.	2-12 mi.		1,262,000	Severe wind and hail.	One person injured at Pittsburg where storm was most severe; extensive property and crop (principally cotton) damage; damage by hail estimated at \$1,035,000.	Do.
Fisher, Hall, Jones, and Childress Counties, Tex.	14					Hail and wind.	Many acres of cotton and feed crops ruined; loss in Hall County alone estimated at \$1,000,000.	Dallas Morning News (Tex.)
Clarksville, Tenn.	16					High winds.	Slight damage reported.	Official, U. S. Weather Bureau.
Alloway, Perry Co., Ky.	16			1	5,000	Small tornado.	Nine persons injured in mining camp.	Do.
Warren County, northeast, into Estill County, Ky.	16		150-440	1	250,000	Tornado.	Heaviest damage in Warren, Hart and Marion Counties; 11 persons seriously and 33 slightly injured.	Do.
Northern Michigan.	18-19					High wind, and snow.	Many lake wharves damaged; elevator tower demolished; navigation completely halted; much damage to overhead wires; traffic impeded.	Official U. S. Weather Bureau; Ludington Daily News (Mich.)
Buffalo, N. Y. and vicinity.	19					High wind.	Trees, wires, and signs blown down; maximum wind velocity 74 miles.	Official U. S. Weather Bureau.
Calhoun, Ga.	19					Moderately high winds.	Dwellings and barns damaged.	Do.
Vermilion Parish, La.	24	11:30 p. m.				Wind squall.	Houses moved from foundations; trees injured.	Do.
Calhoun County, Ala. (north part of).	24	P. m.				Thunderstorm.	Hotel at Piedmont Springs damaged, trees and several houses blown down; communication hampered. Five persons injured near Maxwellborn.	Anniston Star (Ala.)
Allentown, Pa.	24-25					High winds and rain.	Orchards considerably injured; telephone and telegraph communication interrupted; lighting system temporarily out of use.	Official, U. S. Weather Bureau.
Berks County, Pa.	24-25					High winds and rain.	Much minor damage reported.	Do.

¹ Yards when not otherwise specified; "mi" signifies miles.